



Energy Efficiency in District Cooling

Dr. Afif Saif Al Yafei

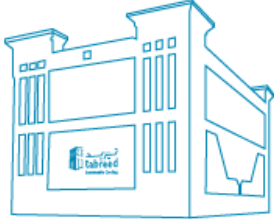
VP – Regional Asset Management

- 1 Tabreed at a Glance
- 2 Our Story
- 3 District Cooling
- 4 Energy Efficiency in District Cooling
- 5 Energy Efficiency in District Cooling - Challenges

Tabreed at a Glance

One of the world's largest district cooling companies

72
plants in
5 countries



1.1m RT
made available to clients
in the GCC in 2017



Equivalent to cooling
110
towers the size of Burj
Khalifa¹



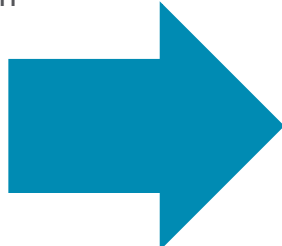
Environmentally responsible operations reducing CO₂ emissions



1.97 billion kWh²
annual reduction in energy consumption
in the GCC through Tabreed's DC
services in 2017



Enough energy to power
112,419²
homes in the UAE every year

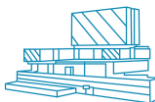


986,748 tons³
annual elimination of CO₂
emissions



The equivalent of removing
214,511³
cars from our streets every year

Exclusive provider of DC services to several iconic projects in GCC



**Cleveland Clinic
Abu Dhabi**



**Dubai Parks
and Resorts**



Dubai Metro



**Sheikh Zayed
Grand Mosque**



Etihad Towers



**Jabal Omar
Project**

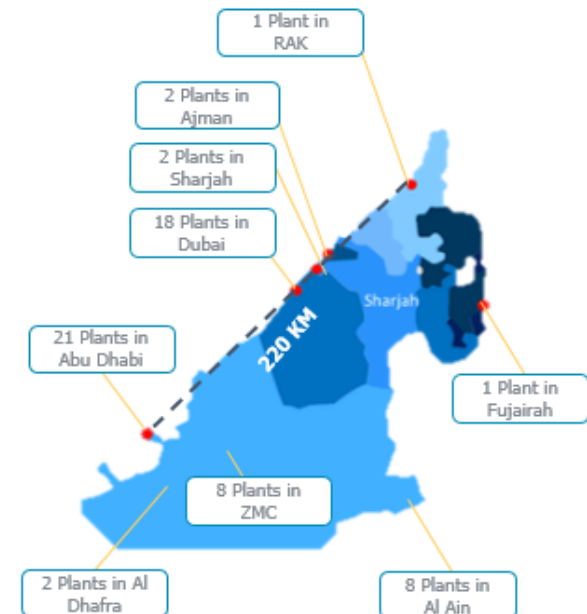
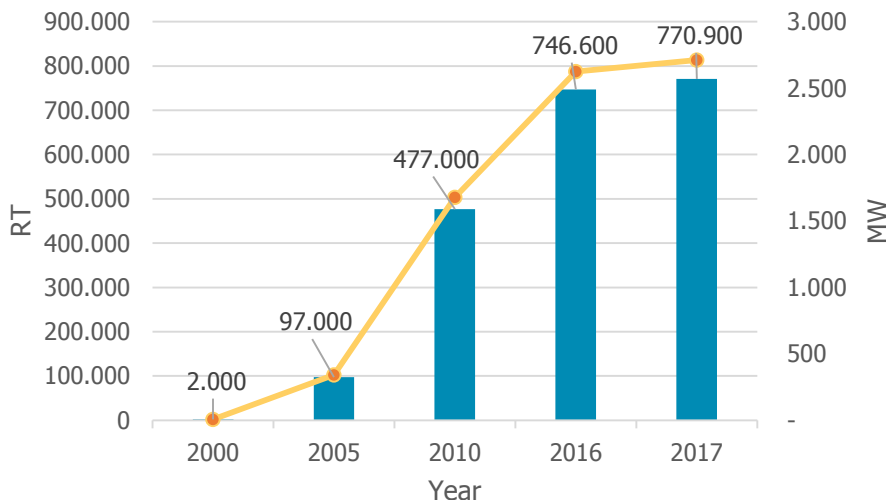
Note: RT refers to Refrigeration Ton
 1 Burj Khalifa estimates -<http://www.burjkhalifa.ae/img/FACT-SHEET.pdf>
 2 District Energy in Cities -www.unep.org, <https://wec-indicators.enerdata.net/household-electricity-use.html>
 3 Environmental report by Emirates Group -<https://www.epa.gov/greenvehicles/greenhouse-gas-emissions-typical-passenger-vehicle>

Our Story

- Established in 1998
- First plant commissioned in 1999 in a remote desert location
- Currently operating 72 plants today across five GCC Countries

| Country | Details |
|------------------|--------------------------------------|
| UAE | 63 plants, total capacity of 773k RT |
| Oman | 3 plants, total capacity of 18k RT |
| KSA | 2 plants, total capacity of 83k RT |
| Bahrain | 1 plant, total capacity of 26k RT |
| Other GCC | 3 plants, total capacity of 214k RT |

Capacity Growth



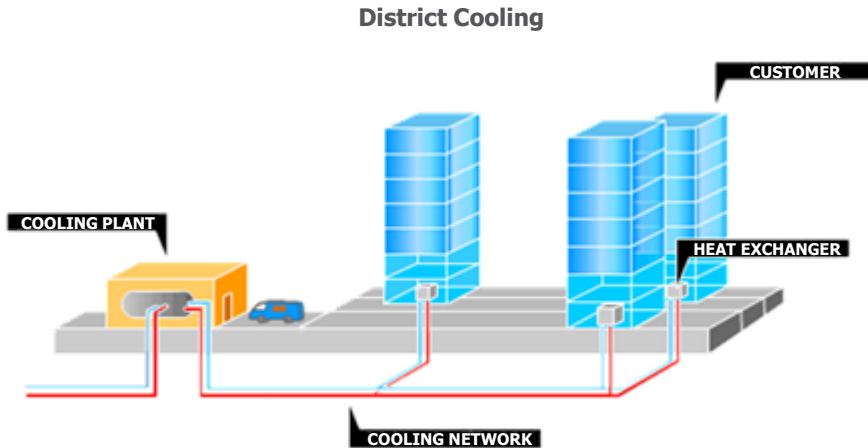
Our Story



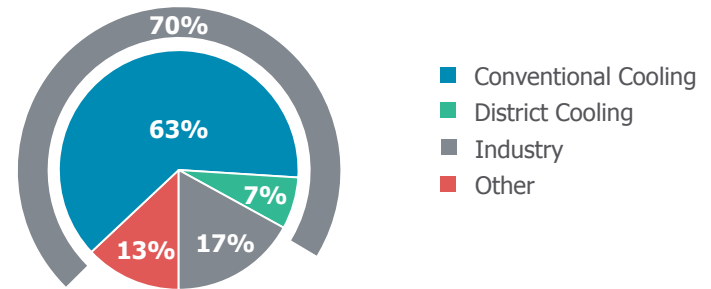
| | | | |
|-------------------------------|---------|------------------------|---------|
| 1. Palm Mall | 8.4k RT | 4. Avenues Mall | 5.5k RT |
| 2. Al Araimi Boulevard | 6.2k RT | 5. Remal Castle | 2.4k RT |
| 3. KOM | 10k RT | | |



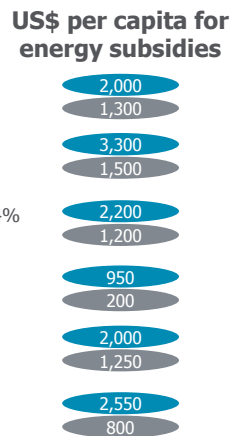
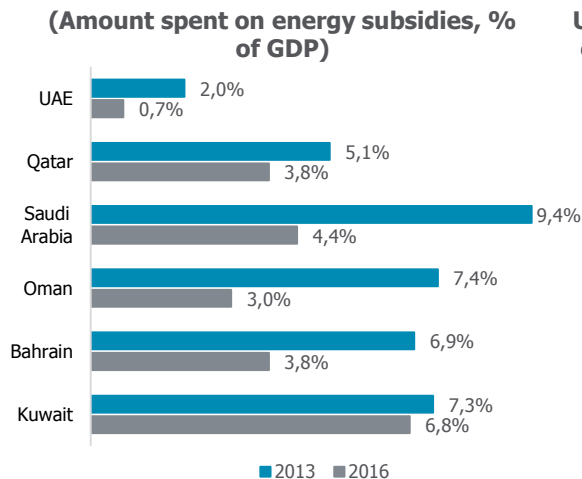
Strong cooling demand due to warm climatic conditions



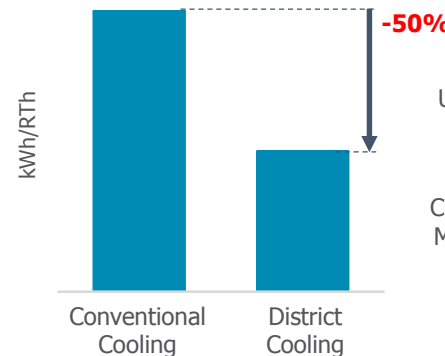
Cooling represents 70% of peak energy consumption across the GCC



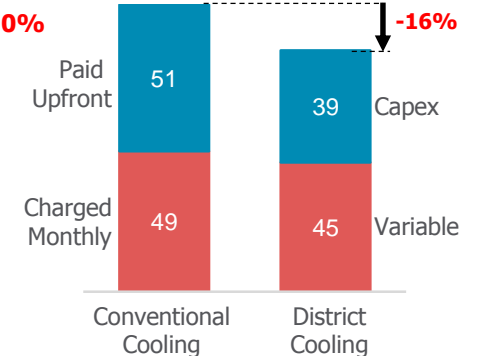
Declining energy subsidies in the region create increased demand for more energy efficient cooling solutions



DC uses 50% less energy than Conventional Cooling



DC life cycle costs ca. 16% lower than Conventional Cooling



Source: Tabreed, Regulatory board websites, World Bank

4 years Journey in Energy Efficiency

A large, vertical yellow arrow pointing downwards, indicating the progression of time from 2014 to 2018.

2014

- Holistic energy optimization software (Advance Process Control)
 - Offline optimization excel tool (R&D with MASDAR Institute)
 - Proprietary optimization software

2015

- Automation Optimization
 - Control loops tuning (Seasonal Operations)
 - Control Logic enhancements

2017

- Performance Management Team
 - Multi-discipline, energy efficiency driven dedicated task force.
 - Remote monitoring and supervision

2018

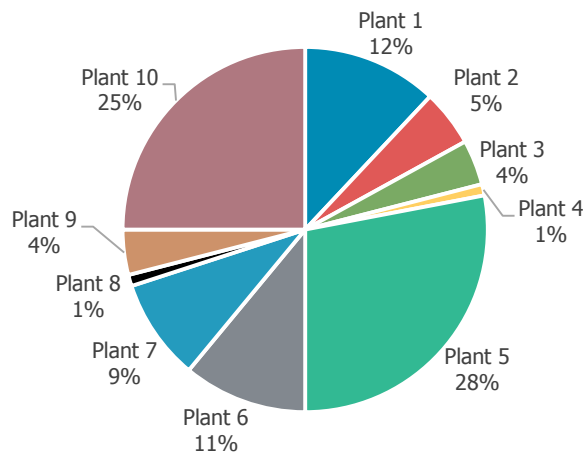
- Operation Excellence
 - Knowledge sharing, best practices
- Retrofit Studies and feasibilities
 - Chillers VSD retrofits (Pilot Implemented in July 2018)
 - Condenser water pumps VSD retrofits (pilot study completed)
- Process data visualization (plant historian)

Performance Management Team:

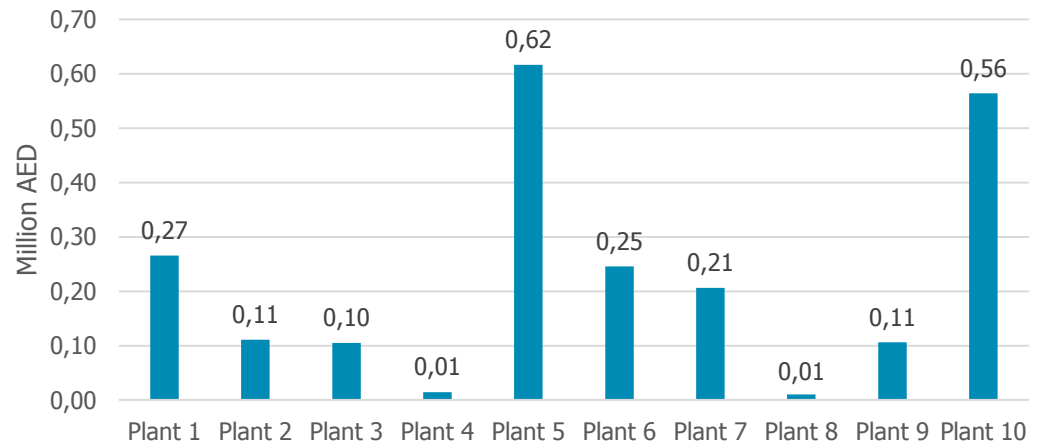
- **Objectives**
 - Optimize Energy consumption of a portfolio of DCP’s to enhance the overall efficiencies.
- **Scope**
 - Monitor and optimize 10 DCP, with set efficiency targets.
- **Methodology**



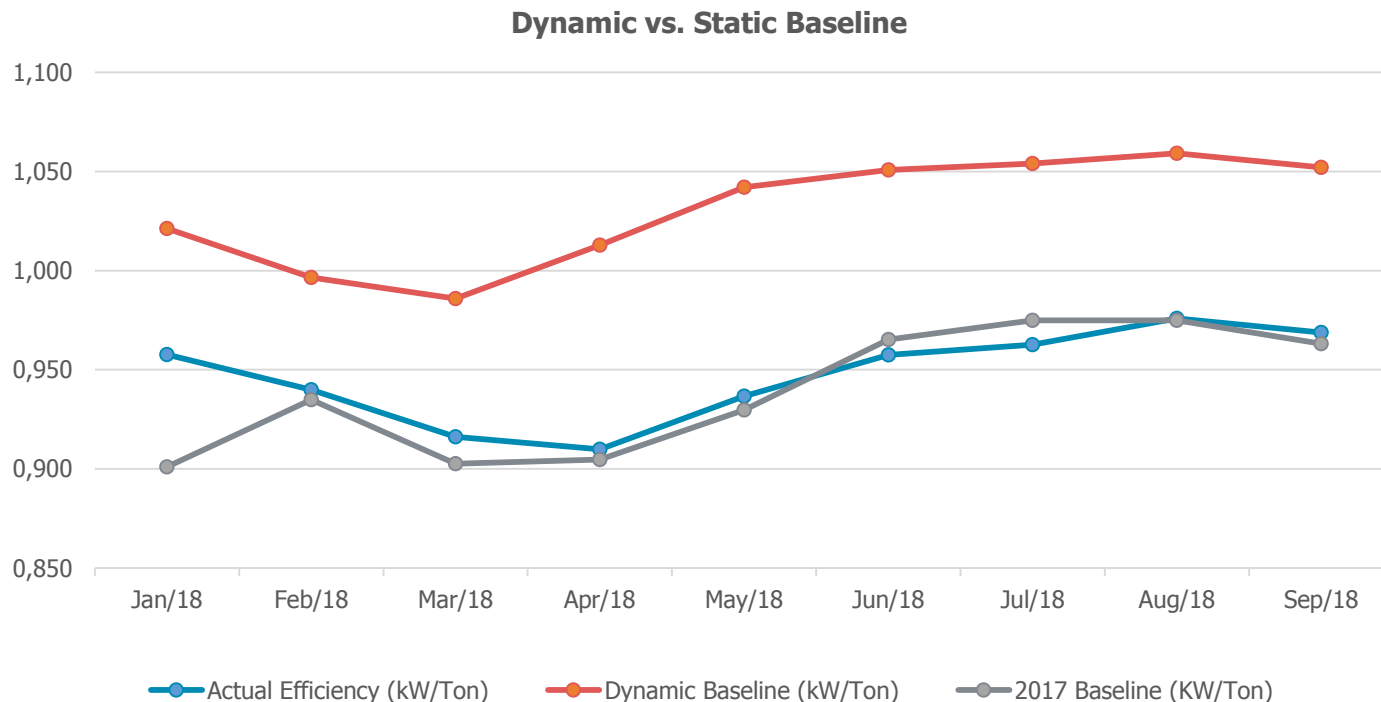
ELECTRICAL EFFICIENCY % SAVINGS (JAN - SEP 2018)



ELECTRICAL EFFICIENCY AED SAVINGS (JAN-SEP 2018)



- **Highly Dynamic industry with multivariables (i.e. ambient conditions, customer loads, etc.)**
- **Establishing Baselines - Dynamic vs. static efficiency (KW/RT)**
 - KPI targets are static, disregards dynamic changes
 - Dynamic baseline adopts the changes and provide better representation of target





- **Limited visibility of plants' operations**

- Scattered Assets
- Reactive actions rather than proactive actions (might extend to 1 month of delay in response)
- Manual data visualization and analysis



- **Transforming the Operation Culture**

- Conservative approach Vs. Aggressive approach
- Energy optimization centric operation culture (through knowledge building and sharing operation best practices by PMT)
- Customers interactions

Thank you

